What is claimed is:

1. A compressed data structure for segmentation of a plurality of samples of compressed waveform data into a plurality of frames and subsequent storage of the frames,

wherein a number of bits per sample of the compressed waveform data is variable between the frames, but uniform within each of the frames,

each of the frames has a same data storage size, and

each of the frames includes, in a predetermined layout, an auxiliary information area for storing auxiliary information that includes compression-related information to be used for decompressing the compressed waveform data, and a data area for storing a plurality of samples of the compressed waveform data of the frame, each of the samples in the frame comprising a same number of bits.

2. A compressed data structure as claimed in claim 1 wherein a data storage area of each of the frames comprises a plurality of addresses regions of a fixed size, and said data area compactly stores a plurality of samples of the compressed waveform data in each of the address regions.

3. A storage device storing compressed waveform data of a plurality of frames having a compressed data structure as defined in claim 1.

4. A tone generation apparatus comprising:

a storage section that stores a plurality of samples of compressed waveform data segmented into a plurality of frames, wherein a number of bits per sample of the compressed waveform data is variable between the frames, but uniform within each of the frames, each of the frames has a same data storage size, and each of the frames includes, in a predetermined layout, an auxiliary information area for storing auxiliary information that includes compression-related information to be used for decompressing the compressed waveform data, and a data area for storing a plurality of samples of the compressed waveform data of the frame, each of the samples comprising a same number of bits;

a number-of-bits designation section that designates the number of bits per sample of the compressed waveform data for each of the frames stored in said storage section;

a readout section that designates any one of the frames to be read out and reads out stored data of the designated frame from said storage section;

a retrieval section that, of the data of the frame read out by said readout section, retrieves the auxiliary information from the auxiliary information area and retrieves the samples of the compressed waveform data from the data area in accordance with the number of bits per sample designated by said number-of-bits designation section;

a decoding section that decompresses each of the samples of

the compressed waveform data retrieved by said retrieval section, using the compression-related information included in the auxiliary information retrieved by said retrieval section; and

a tone generation section that generates a tone on the basis of the waveform data decompressed by said decoding section.

5. A tone generation apparatus as claimed in claim 4 wherein the auxiliary information stored in the auxiliary information area includes number-of-bits information indicative of the number of bits per sample of the compressed waveform data of the frame, and

wherein said number-of-bits designation section designates the number of bits per sample of the compressed waveform data of the frame in accordance with the number-of-bits information included in the auxiliary information retrieved by said retrieval section.

6. A waveform storage processing apparatus comprising:

a compression processing section that compresses a plurality of samples of waveform data;

a framing section that segments the plurality of samples of waveform data, compressed by said compression processing section, into a plurality of frames to thereby generate frame data, wherein said framing section segments the plurality of samples of waveform data into the frames in such a manner that a number of bits per sample of the compressed waveform data is variable between the frames, but uniform within each of the frames, and wherein the frame data generated by said framing section include, in a fixed data

size corresponding to one frame, auxiliary information that includes compression-related information to be used for decompressing the compressed waveform data, and a plurality of samples of the compressed waveform data of the frame; and

a writing section that, for each of the frames, writes the frame data, generated by said framing section, into a storage device in accordance with the fixed data size.

7. A compressed data structure suited for segmentation of a plurality of samples of compressed waveform data into a plurality of frames and subsequent storage of each of the frames into a memory capable of storing n bits per address,

wherein a number of bits per sample of the compressed waveform data is variable between the frames, but uniform within each of the frames,

each of the frames of the compressed waveform data is stored over a predetermined number j of successive addresses of said memory, and

k samples of the compressed waveform data of the frame are stored at m bits of the n bits (where $m < n$) in each of the j addresses, and an auxiliary information area storing auxiliary information that includes compression-related information to be used for decompressing the compressed waveform data is stored at remaining $(n - m)$ bits in the address.

8. A compressed data structure as claimed in claim 7 wherein m

is k times a number of bits i per sample of the compressed waveform data of the frame, where k is an integral number equal to or greater than one.

9. A storage device storing a plurality of frames of compressed waveform data having a compressed data structure as defined in claim 7.

10. A waveform generation apparatus comprising:

a storage device as defined in claim 9;

an address generation section that generates, every sampling cycle, a readout address varying at a predetermined rate corresponding to a designated tone pitch;

a readout section that generates a memory address incrementing by one each time the readout address increments by a value, and accesses said storage device with the memory address to thereby read out data of n bits from said storage device;

an auxiliary information retrieval section that retrieves the data of (n - m) bits from the data of the n bits, read out by said read out section, to thereby output auxiliary information including compression information;

a temporary storage section that retrieves the data of the m bits from the read-out data of the n bits and stores the retrieved data of the m bits; and

a waveform generation section that accesses said temporary storage section with the readout address to thereby sequentially

read out k samples of compressed waveform data, performs a decompression process, on the basis of the compression information outputted by said auxiliary information retrieval section and the sequentially-read-out samples of compressed waveform data, to thereby restore samples of original waveform data, and generates a tone waveform on the basis of the restored samples of original waveform data.

11. A waveform generation apparatus as claimed in claim 10 wherein said temporary storage section is capable of storing one or a plurality of, less than j, the data of the m bits.

12. A waveform storage processing apparatus comprising:

a storage section having a plurality of addresses each having a data width of n bits;

a segmentation section that segments input waveform data into a plurality of frames;

a compression section that, for each of the frames, performs a compression process on the waveform data to thereby generate compressed waveform data of m/k bits;

an auxiliary information generation section that, for each of the frames, generates auxiliary information including compression information indicative of a form of the compression process performed on the frame;

a to-be-written data formation section that, for each of the frames, forms a predetermined number j of to-be-written data of n

bits on the basis of data of m bits formed by retrieving samples of the compressed waveform data, k samples at a time, and data of (n - m) bits sequentially retrieved from the auxiliary information of the frame; and

a writing section that sequentially writes the j to-be-written data, formed for each of the frames, to a predetermined number j of successive addresses of said storage section.

13. A waveform data compression method comprising:

a step of segmenting waveform data comprising a plurality of sample value into a plurality of portions;

a step of setting a loop start point and loop end point in the waveform data in such a manner that at least one of the loop start point and loop end point is set at an enroute point of the portion to which the start point or end point belongs; and

a step of forming frame data of each of the portions by compressing the waveform data for each of the portions, wherein the portion having the loop start point or loop end point set at the enroute point thereof is compressed so as to have same decompression parameters as another portion preceding or following said portion.

14. A waveform data compression method as claimed in claim 13 wherein said step of setting includes:

a step of setting a provisional loop start point and provisional loop end point in the waveform data;

a step of setting the loop end point at a last sampling point in the portion to which the provisional loop end point belongs;

a step of setting the loop start point at a sampling point located behind and spaced apart from the provisional loop start point by a distance equivalent to a total number of samples present between the provisional loop end point and the loop end point; and

a step of copying the sample values from the provisional loop start point to a sampling point immediately preceding the loop start point, as sample values from a sampling point immediately following the provisional loop end point to the loop end point.

15. A waveform data compression method as claimed in claim 14 wherein said step of forming includes:

a first determination step of applying same decompression parameters to two particular portions that comprise a loop start portion including the loop start point and either a loop end portion including the loop end point or a portion to be reproduced following the loop start portion, and determining, for each of the two particular portions, compression codes capable of being decompressed with the same decompression parameters;

a second determination step of, on the basis of the waveform data of each of other portions than the two particular portions, determining decompression parameters for the other portion and compression codes for the other portion which are capable of being decompressed with the decompression parameters determined for the other portion; and

a frame formation step of forming data of a frame on the basis of the compression codes of the sample values in a corresponding one of the portions and the decompression parameters for decompressing the compression codes of the portion to be reproduced following the one portion.

16. A waveform data compression method as claimed in claim 15 wherein said first determination step determines the same decompression parameters on the basis of waveform data obtained by connecting together the waveform data of the two particular portions.

17. A waveform data compression method as claimed in claim 15 wherein the decompression parameters are included dispersedly in each of the frames.

18. A waveform data compression method as claimed in claim 13 wherein said step of setting includes:

a step of setting a provisional loop start point and provisional loop end point in the waveform data;

a step of setting the loop start point at a leading sampling point of the portion following the portion to which the provisional loop start point belongs;

a step of setting the loop end point at a sampling point located behind and spaced apart from the provisional loop end point by a distance equivalent to a total number of samples present between

the provisional loop start point and the loop start point; and

a step of copying the sample values from the provisional loop start point to a sampling point immediately preceding the loop start point, as sample values from a sampling point immediately following the provisional loop end point to the loop end point.

19. A waveform data compression method as claimed in claim 18 wherein said step of forming includes:

a first determination step of applying same decompression parameters to two particular portions that comprise a loop end portion including the loop end point and either a loop start portion including the loop start point or a portion to be reproduced before the loop start portion, and determining, for each of the two particular portions, compression codes capable of being decompressed with the same decompression parameters;

a second determination step of, on the basis of the waveform data of each of other portions than the two particular portions, determining decompression parameters for the other portion and compression codes for the other portion which are capable of being decompressed with the decompression parameters determined for the other portion; and

a frame formation step of forming data of a frame on the basis of the compression codes of the sample values in a corresponding one of the portions and the decompression parameters for decompressing the compression codes of the portion to be reproduced following the one portion.

20. A waveform data compression method as claimed in claim 19 wherein said first determination step determines the same decompression parameters on the basis of waveform data obtained by connecting together the waveform data of the two particular portions.

21. A waveform data compression method as claimed in claim 19 wherein the decompression parameters are included dispersedly in each of the frames.

22. A computer-readable program containing a group of instructions for causing the computer to perform a waveform data compression method, said waveform data compression method comprising:

a step of segmenting waveform data comprising a plurality of sample value into a plurality of portions;

a step of setting a loop start point and loop end point in the waveform data in such a manner that at least one of the loop start point and loop end point is set at an enroute point of the portion to which the start point or end point belongs; and

a step of forming frame data of each of the portions by compressing the waveform data for each of the portions, wherein the portion having the loop start point or loop end point set at the enroute point thereof is compressed so as to have same decompression parameters as another portion preceding or following

said portion.

23. A waveform data compression apparatus comprising:

a section that segments waveform data comprising a plurality of sample value into a plurality of portions;

a section that sets a loop start point and loop end point in the waveform data in such a manner that at least one of the loop start point and loop end point is set at an enroute point of the portion to which the start point or end point belongs; and

a section that forms frame data of each of the portions by compressing the waveform data for each of the portions, wherein the portion having the loop start point or loop end point set at the enroute point thereof is compressed so as to have same decompression parameters as another portion preceding or following said portion.

24. A tone signal generation method for generating a tone signal by use of a memory storing a plurality of frames each including compression codes obtained by compressing waveform data over a portion thereof and decompression parameters for decompressing the compression codes of a next portion, said method comprising:

a step of generating readout addresses in such a manner that the readout addresses vary at a rate corresponding to a pitch of a tone signal to be generated;

a readout step of reading out data of the frames from said memory on the basis of the readout addresses generated by said step

of generating;

a decompression step of decompressing the compression codes of a particular portion included in any one of the frames read out by said readout step, on the basis the decompression parameters of said particular portion having been included in a previously-read-out frame, to thereby reproduce a tone signal; and

a loop control step of, on condition that the readout address has reached a loop end point, setting the readout address at a loop start point,

wherein at least one of a loop start point and loop end point is set at an enroute point of the portion to which the start point or end point belongs, and the portion having the loop start point or loop end point set at the enroute point thereof has same decompression parameters as another portion preceding or following said portion.

25. A tone signal generation method as claimed in claim 24 wherein, on condition that the readout address has reached the loop end point that is a last sampling point of a predetermined loop end frame, said loop control step performs to set the readout address at the loop start point that is an enroute sampling point in a predetermined loop start frame.

26. A tone signal generation method as claimed in claim 25 wherein said decompression step includes:

a step of, when the loop start frame is read out for the first time by said readout step, decompressing the compression codes of

the loop start frame on the basis of the decompression parameters included in the frame read out immediately before the loop start frame;

a step of, when the loop start frame is read out for the second time or at a later time by said readout step, decompressing the compression codes of the loop start frame on the basis of the decompression parameters applied to decompression of the compression codes of the loop end frame;

a step of, when the frame following the loop start frame is read out for the first time by said readout step, decompressing the compression codes of the frame following the loop start frame on the basis of the decompression parameters included in the loop start frame;

a step of, when the frame following the loop start frame is read out for the second time or at a later time by said readout step, decompressing the compression codes of the frame following the loop start frame on the basis of the decompression parameters included in the loop end frame; and

a step of, when another of the frames is read out by said readout step, decompressing the compression codes of the other frame on the basis of the decompression parameters included in the frame read out immediately before the other frame.

27. A tone signal generation method as claimed in claim 25 wherein said decompression step includes:

a step of, when the frame following the loop start frame is read

out for the first time by said readout step, decompressing the compression codes of the frame following the loop start frame on the basis of the decompression parameters included in the loop start frame;

a step of, when the frame following the loop start frame is read out for the second time or at a later time by said readout step, decompressing the compression codes of the frame following the loop start frame on the basis of the decompression parameters included in the loop end frame; and

a step of, when another of the frames is read out by said readout step, decompressing the compression codes of the other frame on the basis of the decompression parameters included in the frame read out immediately before the other frame.

28. A tone signal generation method as claimed in claim 24 wherein, on condition that the readout address has reached the loop end point that is an enroute point of a predetermined loop end frame, said loop control step performs to set the readout address at the loop start point that is a leading sampling point in a predetermined loop start frame.

29. A tone signal generation method as claimed in claim 28 wherein said decompression step includes:

a step of, when the loop start frame is read out for the first time by said readout step, decompressing the compression codes of the loop start frame on the basis of the decompression parameters

included in the frame read out immediately before the loop start frame;

a step of, when the loop start frame is read out for the second time or at a later time by said readout step, decompressing the compression codes of the loop start frame on the basis of the decompression parameters applied to decompression of the compression codes of the loop end frame; and

a step of, when another of the frames is read out by said readout step, decompressing the compression codes of the other frame on the basis of the decompression parameters included in the frame read out immediately before the other frame.

30. A tone signal generation method as claimed in claim 28 wherein said decompression step includes:

a step of, when the loop start frame is read out for the first time by said readout step, decompressing the compression codes of the loop start frame on the basis of the decompression parameters included in the frame read out immediately before the loop start frame;

a step of, when the loop start frame is read out for the second time or at a later time by said readout step, decompressing the compression codes of the loop start frame on the basis of the decompression parameters applied to decompression of the frame immediately preceding the loop end frame;

a step of, when the loop end frame is read out by said readout step, decompressing the compression codes of the loop end frame on

the basis of the decompression parameters applied to decompression of the frame immediately preceding the loop end frame; and

a step of, when another of the frames is read out by said readout step, decompressing the compression codes of the other frame on the basis of the decompression parameters included in the frame read out immediately before the other frame.

31. A computer-readable program containing a group of instructions for causing the computer to perform a tone signal generation method for generating a tone signal by use of a memory storing a plurality of frames each including compression codes obtained by compressing waveform data over a portion thereof and decompression parameters for decompressing the compression codes of a next portion, said method comprising:

a step of generating readout addresses in such a manner that the readout addresses vary at a rate corresponding to a pitch of a tone signal to be generated;

a readout step of reading out data of the frames from said memory on the basis of the readout addresses generated by said step of generating;

a decompression step of decompressing the compression codes of a particular portion included in any one of the frames read out by said readout step, on the basis the decompression parameters of said particular portion having been included in a previously-read-out frame, to thereby reproduce a tone signal; and

a step of, on condition that the readout address has reached a

loop end point, setting the readout address at a loop start point,

wherein at least one of a loop start point and loop end point is set at an enroute point of the portion to which the start point or end point belongs, and the portion having the loop start point or loop end point set at the enroute point thereof has same decompression parameters as another portion preceding or following said portion.

32. A tone signal generation apparatus comprising:

a memory storing a plurality of frames each including compression codes obtained by compressing waveform data over a portion thereof and decompression parameters for decompressing the compression codes of a next portion, said tone signal generation apparatus comprising:

an address generation section that generates readout addresses in such a manner that the readout addresses vary at a rate corresponding to a pitch of a tone signal to be generated;

a readout section that reads out data of the frames from said memory on the basis of the readout addresses generated by said address generation section;

a decompression section that decompresses the compression codes of a particular portion included in any one of the frames read out by said readout section, on the basis the decompression parameters of said particular portion having been included in a previously-read-out frame, to thereby reproduce a tone signal; and

a section that, on condition that the readout address has reached a loop end point, sets the readout address at a loop start

point,

wherein at least one of a loop start point and loop end point is set at an enroute point of the portion to which the start point or end point belongs, and the portion having the loop start point or loop end point set at the enroute point thereof has same decompression parameters as another portion preceding or following said portion.